

Debian for Embedded Systems: Best Practices

Vagrant Cascadian, Aikidev, LLC

ELC 2018-03-14

Who am I

- Using Linux kernel and GNU userland: 1997
- Debian contributor: 2004
- Maintaining U-boot in Debian: 2013
- Reproducible Builds armhf build farm: 2015
- Black belt in Aikido: 2016

- Project started in 1993
- Contains over 25000 source packages
- Regular security updates
- Supports several architectures

Debian Social Contract

- 100% Free
- Give back to the community
- Transparency
- Users
- Pragmatic compromise

https://www.debian.org/social_contract

The Debian Free Software Guidelines (DFSG)

- Use
- Modify
- Redistribute
- Avoids vendor lock-in

https://www.debian.org/social_contract#guidelines

Debian Policy

- Best practices
- Mandatory requirements

<https://www.debian.org/doc/debian-policy/>

Debian Release Cycle

- Oldstable (jessie 8)
- Stable (stretch 9)
- Testing (buster 10)
- Unstable (sid)

Over 100 derivatives:

- Armbian
- FreedomBox
- Raspbian
- Tails
- Ubuntu

<https://wiki.debian.org/Derivatives/Census>

Reproducible builds

- Debian is 85-93% reproducible
- Recommended by Debian Policy late 2017

<https://reproducible-builds.org>

- <https://tracker.debian.org/linux>
- Backport patches from upstream

U-boot Bootloader

- <https://tracker.debian.org/u-boot>
- Usually Backport patches from upstream

- Not yet in Debian: <https://bugs.debian.org/881620>
- atf-allwinner recently available: <https://tracker.debian.org/atf-allwinner>

Driver Firmware (Binary Blobs)

May have incompatible licensing:

- wireless
- bluetooth
- USB
- ethernet

Full support with all components available in Debian:

- Linux
- Bootloader
- System or driver firmware

<https://d-i.debian.org/daily-images/armhf/daily/netboot/SD-card-images/>



Upstream support:

- Linux (partial)
 - fn-key not working
 - nubs not working
 - wifi not working
 - usb not working
- U-boot (partial)
 - Serial output only

OpenPandora: The Kernel

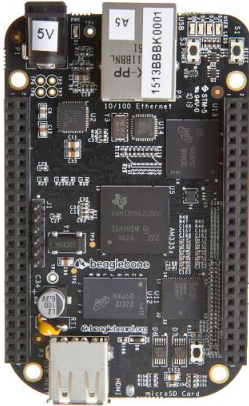


Based on Linux 3.2, with over 100 patches:

- Security update
- Rebase
- Build
- Test
- Repeat

(USB still never worked for me)

Beaglebone Black



Upstream support:

- Linux (decent)
- U-boot (decent)



- Hard to search for "CHIP" online
- NAND on early models not supported mainline Linux
- Vendor bootloader doesn't boot kernel with initrd
- mainline u-boot doesn't support NAND

Fight or Flight



Engage and Blend

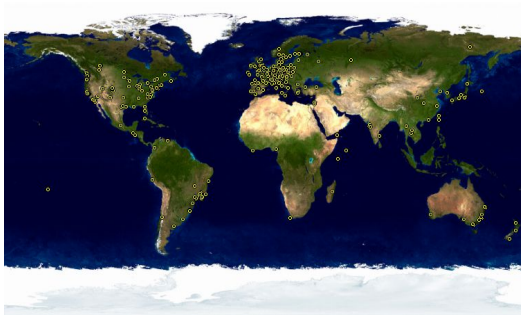


- Roll with it
- Engage
- Blend

- Debian stable with patched version of LTS Linux kernel

- Bootloader
 - Vendor bootloader may not support features (raw initrd)
- Boot firmware
 - Common in the x86 world

- Follow stable with individual backported packages
 - Not present in Debian at all
 - Newer versions than in Debian stable



- Over 1000 developers and maintainers
- Individuals or Teams maintain packages

- Mailing lists: <https://lists.debian.org>
- IRC: <irc.oftc.net>
- Wiki: <https://wiki.debian.org>

- Annual conference: <https://debconf.org>
- Mini-conferences: <https://wiki.debian.org/MiniDebConf>
- Bug squashing parties: <https://wiki.debian.org/BSP>

Debian Package Tracker

`https://tracker.debian.org/PACKAGE`

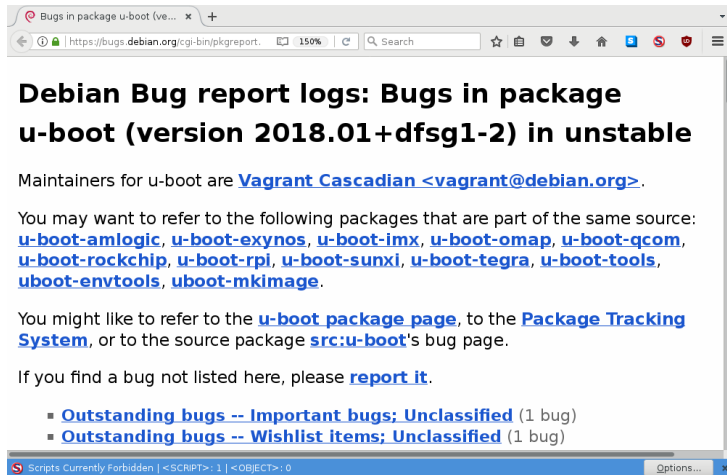
The screenshot shows the Debian Package Tracker interface for the 'linux' package. The browser address bar displays 'https://tracker.debian.org/pkg/linux'. The page features a search bar at the top right with the text 'jump to package...' and a 'Go' button. Below the search bar are links for 'Register | Log in' and a 'Subscribe' button. The main content area is divided into several sections:

- general**:
 - source: [linux](#)
 - version: 4.15.4-1
 - maintainer: [Debian Kernel Team \(archive\)](#) [DMD]
 - uploaders: [maximilian attems](#) [DMD] - [Ben Hutchings](#) [DMD] - [Salvatore Bonaccorso](#) [DMD] - [Bastian Blank](#) [DMD]
 - arch: all
 - std-ver: 4.1.1
 - VCS: [Git \(Browse, QA\)](#)
- action needed**:
 - A new upstream version is available: [4.15.6](#) [high]
 - 52 security issues in wheezy [high]
 - 44 security issues in jessie [high]
 - 12 security issues in buster [high]
 - 12 security issues in sid [high]
 - 14 security issues in stretch [high]
 - lintian reports 1036 warnings [high]
 - Multiarch hint reports 3 issue(s) [normal]
 - Does not build reproducibly during testing [normal]
 - Depends on packages which need a new maintainer [normal]
 - 79 bugs tagged patch in the [BTS](#) [normal]
 - A new version is available in the VCS, consider uploading it. [normal]
 - Build log checks report 2 warnings [low]
 - Standards version of the package is outdated. [wishlist]
- bugs**:
 - all: 2146 2072
 - RC: 19 18
 - I&N: 1963 1896
 - M&W: 163 157
 - F&P: 1
- links**:
 - [homepage](#)
 - [lintian](#) (0, 1036)
 - build: [logs](#), [checks](#), [clang](#), [reproducibility](#)
 - [popcon](#)
 - [browse source code](#)
 - search source code
 - [edit tags](#)
 - [security tracker](#)
- versions**:
 - o-o-stable: 3.2.78-1
 - o-o-sec: 3.2.96-3
 - o-o-bpo: 3.16.39-1+deb8u1~bpo70+1
 - oldstable: 3.16.51-2
 - old-sec: 3.16.51-3+deb8u1
 - old-bpo: 3.16.51-3+deb8u1
- news**:
 - [2018-02-25] Accepted linux 4.9.82-1+deb9u2 (all source) into proposed-updates->stable-new, proposed-updates (Yves-Alexis Perez)
- ubuntu**:
 - version: 4.15.0-10.11

The bottom of the page shows a status bar with the text 'Scripts Currently Forbidden | <SCRIPT>: 6 | <OBJECT>: 1' and a search bar.

Debian Bug Tracker: web interface

`https://bugs.debian.org/PACKAGE`



Debian Bug Tracker: email interface

From: vagrant
To: submit@bugs.debian.org
Subject: Backported patch to ...

Package: linux
Version: 4.15.4-1
Severity: wishlist
Tags: patch

The following patch from upstream ...

Contributing to Debian

- Report on features and bugs: <https://www.debian.org/Bugs/Reporting>
- Become a Maintainer or Developer: <https://www.debian.org/devel/join/>

Swimming upstream



Thanks

- Linux Foundation
- Debian
- Countless people pushing things upstream

Copyright 2018 Vagrant Cascadian <vagrantc@aikidev.net>, Aikidev, LLC

This work is licensed under the Creative Commons Attribution-ShareAlike 4.0 International License.

To view a copy of this license, visit <https://creativecommons.org/licenses/by-sa/4.0/>

Works used

<https://en.wikipedia.org/wiki/File:PandoraFront.JPG> By Michael Mrozek, licensed under <https://creativecommons.org/licenses/by/1.0/deed.en>

https://en.wikipedia.org/wiki/File:Beaglebone_Black.jpg By BeagleBoard.org Foundation, licensed under <https://creativecommons.org/licenses/by-sa/3.0/deed.en>

[https://en.wikipedia.org/wiki/File:This_was_a_timely_capture_\(3926001309\).jpg](https://en.wikipedia.org/wiki/File:This_was_a_timely_capture_(3926001309).jpg) By Peretz Partensky, licensed under <https://creativecommons.org/licenses/by-sa/2.0/deed.en>

https://commons.wikimedia.org/wiki/File:Aikido_Nikkyo.jpg By <https://www.flickr.com/photos/tharso/>

<https://creativecommons.org/licenses/by-sa/2.0/deed.en>

https://en.wikipedia.org/wiki/File:Salmon_leaping_at_Willamette_Falls.jpg In the Public Domain

<https://www.debian.org/devel/developers.map.jpeg> by Debian, licensed <https://www.debian.org/legal/licenses/mit>